REMARKS

The Applicant requests reexamination and reconsideration of the Application in view of the preceding amendments and the following remarks.

Applicant has amended claims 22-29 to better define the invention. These amendments do not add any new matter. Support for these amendments can be found in the subject Application in Fig. 11 and the corresponding text at page 14, lines 14-20.

The Examiner rejects claims 22-29 under 35 U.S.C §102(b) as allegedly being anticipated by U.S. Patent No. 4,659,224 to Monchalin (hereinafter "Monchalin"). Applicant respectfully traverses the Examiner's rejection in view of the above amendments and following remarks and submits that the claims herein are patentable over the prior art.

The subject invention results from the realization that a truly elegant yet extremely reliable continuous and high speed detection system for detecting a flaw in a medium such as a conveyor belt, cable, rope, railroad track or road can be effected by sensing a Doppler shift in a carrier signal caused by a flaw.

This invention features a flaw detection system using acoustic Doppler effect for detecting flaws in a medium wherein there is relative motion between the medium and system. There is an air-coupled transducer or transducer means, spaced from the medium to be inspected, for introducing to and receiving from the medium an acoustic signal that propagates in said medium at a predetermined frequency. There is also a detector or detector means, for detecting in the received acoustic signal the Doppler shifted frequency representative of a flaw in the medium.

Fig. 4 of Monchalin shows a laser system 7 that emits an incident beam 9 of

substantially monochromatic coherent light. An interferometer 22 measures the Doppler effect of the scattered light from the laser system 7. Monchalin does not disclose, however, an air-coupled transducer or transducer means for receiving from the medium an acoustic signal, nor a detector or detector means, responsive to the received propagating acoustic signal, for detecting in the received acoustic signal the Doppler shifted frequency representative of a flaw in the medium.

Instead, Monchalin describes that it senses light and measures the Doppler effect from light energy:

> The apparatus of the present invention is for measuring the Doppler shift produced in a beam of coherent light when the said beam is scattered by a surface portion of a material undergoing deformation responsive to the presence of an ultrasonic wave. The apparatus comprises a laser system for transmitting an incident beam of coherent light and modulation means for modulating the incident beam with a predetermined frequency f_M. ... An interferometer of the confocal FabryPerot type is disposed in the path of the scattered beam transmitted by the optical assembly means for producing an optical interferometer signal.

(Monchalin at Col. 3, lines 11-27, emphasis added). Monchalin further makes clear that the interferometer 22 measures electromagnetic light energy:

> Apertures 26 and 27 [of the Fabry-Perot interferometer 22] limit the inclination of the light rays to satisfy the proper operating conditions of the interferometer 22. In order to use all the light energy provided by the laser system, the illuminated spot size on the surface portion 20 should match exactly aperture 27 and the usable area of the central fringe inside the confocal Fabry-Perot interferometer 22.

(Monchalin at Col. 6, line 5-11, emphasis added.)

Moreover, Monchalin does not disclose using acoustic Doppler effect to detect flaws in a medium as does the subject invention. Monchalin discloses:

> [A] non-contact optical technique for measuring small deformations at a surface portion of a material produced by an ultrasonic wave energy. More particularly, it is concerned with an apparatus and a method of measuring the optical Doppler shift produced in a beam of coherent light from a laser when the beam is scattered by the surface portion of the material which is undergoing deformation responsive to the ultrasonic wave energy.

(Monchalin at Col. 1, lines 6-14, emphasis added). It is clear from this passage that Monchalin is limited to a method of measuring the optical Doppler effect produced by a beam of coherent light.

In contrast, claim 22 of the subject Application as amended recites: "A flaw detection system using acoustic Doppler effect for detecting flaws in a medium wherein there is relative motion between the medium and system comprising: air-coupled transducer means, spaced from the medium to be inspected, which transmit optical energy for introducing to and receiving from the medium an acoustic signal that propagates in said medium at a predetermined frequency; and means, responsive to the received propagating acoustic signal, for detecting in the received acoustic signal the Doppler shifted frequency representative of a flaw in the medium." (Emphasis added.) Monchalin does not disclose nor suggest a flaw detection system that receives from the medium an acoustic signal for detecting in the received acoustic signal the Doppler shifted frequency representative of a flaw in the medium. Independent claims 24-26 and 28-29 as amended likewise recite similar features that clearly distinguish the subject invention from Monchalin.

As noted in the subject Application, there are significant advantages from using air-coupled transducers that sense acoustic signals:

> Air-coupled transducers are attractive because they allow ultrasound to propagate through gaseous media without requiring mechanical contact between the transducer and the medium to be inspected. When used for inspecting railroad tracks the acoustic impedance mismatch between the steel and air is used to great advantage since it reflects most of the energy from the steel surface back to the transducer. When the invention is employed in railroad rail monitoring, a typical car speed for monitoring the rail may reach above sixty miles per hour and in fact, increased car speed leads to more pronounced Doppler effects and better overall efficiency.

(The subject Application at p.10, lines 9-16, *emphasis added*).

In conclusion, Monchalin shows a system that transmits light energy which induces an ultrasonic signal in a medium. Monchalin, however, detects a Doppler shift in light energy that has changed due to the induced ultrasonic signal. On the other hand, the subject invention induces an acoustic signal in a medium, but uses an air-coupled transducer or transducer means to receive acoustic energy to determine the Doppler shift.

Accordingly, Monchalin, which only describes using light energy, does not disclose nor suggest the subject invention. Applicant respectfully requests that the Examiner withdraw the rejection of claims 22-29 under 35 U.S.C §102(b).

Each of the Examiner's rejections and objections has been addressed or traversed. Accordingly, it is respectfully submitted that the Application is in condition for allowance. Early and favorable action is respectfully requested.

If for any reason this Response is found to be incomplete, or if at any time it appears that a telephone conference with counsel would help advance prosecution, please telephone the undersigned, or his associates, collect in Waltham, Massachusetts, at (781) 890-5678.

Respectfully submitted,

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